WE CLAIM:

1. A method for approximating CAD data representing a three-dimensional object, comprising steps of:

(a) generating a mesh with mesh lines for approximating each face of the three-dimensional object represented by the CAD data within a rough conversion tolerance with respect to a specified conversion tolerance;

(b) approximating a boundary edge surrounding and defining each individual face with a plurality of curves within the specified conversion tolerance, approximating each of the curves with a polyline comprising points and connecting lines within the rough conversion tolerance to define boundary points which are the points of the polylines, and obtaining a vector tangential to the curve at each of the boundary points;

(c) generating polygons with three or four vertices by connecting internal points which are points of intersection of the mesh lines inside the boundary edge, and by connecting the boundary points and the internal points that are adjacent to and inside the boundary edge;

(d) calculating a vector normal to the face at each of the vertices of each of the polygons, storing information identifying the vertices and the corresponding normal vectors, and storing the tangential vector at each of the boundary points obtained at the step (b);

(e) converting each of the polygons with three or four vertices to a triangular or quadrilateral surface respectively, by using a plurality of control points obtained by processing the information identifying the vertices, the normal vectors, and the tangential vectors; and

(f) examining if each of the triangular or quadrilateral surfaces is close to the face represented by the CAD data within the specified conversion tolerance, and if not, regenerating a mesh with a narrower mesh width and more mesh lines on the face to repeat the steps (c) - (e) and (f).

2. The method for approximating CAD data representing a three-dimensional object according to Claim 1, further comprising a step of

(g) joining adjacent two polygons from different faces across the boundary edge by identifying the boundary points common to both of the polygons.

3. The method for approximating CAD data representing a three-dimensional object according to Claim 1, wherein the polygons are triangles.

4. The method for approximating CAD data representing a three-dimensional object according to Claim 1, wherein the curve is a Bezier curve.

5. The method for approximating CAD data representing a three-dimensional object according to Claim 1, wherein the surface is a Bezier surface.

6. The method for approximating CAD data representing a three-dimensional object according to Claim 1, wherein in the step (e), the control points between two internal points are generated by use of the normal vector at each of the internal points, the control points between one internal point and one boundary point are generated by use of the normal vector at each of the internal and boundary points, and the control points between two boundary points are generated by use of the tangential vector at each of the boundary points.

7. The method for approximating CAD data representing a three-dimensional object according to Claim 1, further comprising steps of:

(h) tessellating each of the surfaces into sub-polygons, the surfaces having been generated by using the control points obtained by processing the information identifying the vertices, the normal vectors, and the tangential vectors stored at the step (d); and

(i) displaying a three-dimensional shape comprised of the sub-polygons.

8. A method for displaying a three-dimensional object represented by CAD data, comprising steps of:

(j) receiving and storing information identifying the vertices and the

corresponding normal vectors for each of the polygons, and the tangential vector at each of the boundary points;

(k) tessellating each of the surfaces into sub-polygons, the surfaces having been generated by using the control points obtained by processing the information identifying the vertices, the normal vectors, and the tangential vectors stored at the step (j); and

(l) displaying a three-dimensional shape comprised of the sub-polygons.

9. The method for displaying a three-dimensional object represented by CAD data according to Claim 8, wherein the polygons are triangles.

10. The method for displaying a three-dimensional object represented by CAD data according to Claim 8, wherein the curve is a Bezier curve.

11. The method for displaying a three-dimensional object represented by CAD data according to Claim 8, wherein the surface is a Bezier surface.

12. The method for displaying a three-dimensional object represented by CAD data according to Claim 8, further comprising a step of

(m) display switching, comprising steps of:

acquiring display conditions including display shapes and sizes;

determining whether or not a detailed display be performed depending on the display conditions; and

executing the steps (j) – (l), if it is determined that the detailed display be performed, or displaying the polygons based on the information stored at the step (j), otherwise.

13. A computer program product for use in a computer system for approximating CAD data representing a three-dimensional object, comprising:

a computer memory medium;

a command for generating a mesh with mesh lines for approximating each face of

the three-dimensional object represented by the CAD data within a rough conversion tolerance with respect to a specified conversion tolerance;

a command for approximating a boundary edge surrounding and defining each individual face with a plurality of curves within the specified conversion tolerance, approximating each of the curves with a polyline comprising points and connecting lines within the rough conversion tolerance to define boundary points which are the points of the polylines, and obtaining a vector tangential to the curve at each of the boundary points;

a command for generating polygons with three or four vertices by connecting internal points which are points of intersection of the mesh lines inside the boundary edge, and by connecting the boundary points and the internal points that are adjacent to and inside the boundary edge;

a command for calculating a vector normal to the face at each of the vertices of each of the polygons, storing information identifying the vertices and the corresponding normal vectors, and storing the tangential vector at each of the boundary points;

a command for converting each of the polygons with three or four vertices to a triangular or quadrilateral surface respectively, by using a plurality of control points obtained by processing the information identifying the vertices, the normal vectors, and the tangential vectors; and

a command for examining if each of the triangular or quadrilateral surfaces is close to the face represented by the CAD data within the specified conversion tolerance, and if not, regenerating a mesh with a narrower mesh width and more mesh lines on the face to repeat the above commands.

14. A computer program product for use in a computer system for displaying a three-dimensional object represented by CAD data, comprising:

a computer memory medium;

a command for receiving and storing information identifying the vertices and the corresponding normal vectors for each of the polygons, and the tangential vector at each of the boundary points;

a command for tessellating each of the surfaces into sub-polygons, the surfaces having been generated by using the control points obtained by processing the information identifying the vertices, the normal vectors, and the tangential vectors; and

a command for displaying a three-dimensional shape comprised of the sub-polygons.